WHAT IS CLAIMED IS:

2	(Currently Amended) 1. A method of simulating physical dynamics of a
3	predetermined set of objects that are part of a computer/video game, the objects
4	connected to each other at one or more respective links, with at least one link representing
5	a hard contact between separate objects, wherein the method utilizes a game system
6	comprising a collision subsystem, a dynamics subsystem, a game logic subsystem, a
7	graphics subsystem and one or more central processing units supporting the game system;
8	the method further comprising:
9	a. grouping a first and a second object in the predetermined set of
10	objects to define a first binary object;
11	b. solving a solution for the physical dynamics solving for the
12	physical dynamics of the objects in the first binary object at a first set of links;
13	c. grouping a third object to the first binary object to define a second
14	binary object, the third object having at least one link to the first binary object, thereby
15	defining a second set of links;
16	d. solving a solution for the physical dynamics of the objects in the
17	second binary object at the second set of links; and
18	e. recursively grouping additional objects to create additional binary
19	objects and solving for the physical dynamics of the additional binary objects.
20	(Original) 2. The method of claim 1 including the step of
21	providing, for each link, one or more link weight values operable to constrain the
22	solution.
23	(Currently Amended) 3. The method of claim 2 further including the step of

performing multiple iterative solutions performing an iterative solution method multiple

1	times where at least one link weight value is adjusted at each iteration.
2	(Original) 4. The method of claim 3 where the link weight values
3	are adjusted to maintain a set of constraints on the links within a predetermined
4	acceptable tolerance.
5	(Original) 5. The method of claim 4 where the set of constraints
6	includes the following constraints: the objects cannot interpenetrate each other and no
7	adhesive normal forces are applied at the links.
8	(Original) 6. The method of claim 5 where the predetermined
9	acceptable tolerance includes a predetermined amount of interpenetration at a link.
10	(Original) 7. The method of claim 6 where the predetermined
11	acceptable tolerance includes a predetermined amount of adhesive normal force at a link.
12	(Currently Amended) 8. The method of claim 7 where the set of constraints
13	further includes the constraint that, at a respective link, either the relative lateral motion is
14	zero or the friction force at the link is equal to the normal force times the coefficient of
15	friction a coefficient of friction.
16	(Original) 9. The method of claim 8 where the predetermined
17	acceptable tolerance includes a predetermined difference between the friction force at a
18	link and the normal force times the coefficient of friction.
19	(Currently Amended) 10. A method of simulating physical dynamics of a
20	predetermined set of objects that are part of a computer video game, the objects
21	connected to each other by at least one respective link, and where at least one object is not
22	a rigid body, wherein the method utilizes a game system comprising a collision
23	subsystem, a dynamics subsystem, a game logic subsystem, a graphics subsystem and one

1	or more central processing units supporting the game system; the method further
2	comprising:
3	a. providing, for at least one object, a set of reaction values
4	describing the motion of the object in response to applied forces;
5	b. solving a solution to the physical dynamics solving for the physical
6	dynamics of the set of objects using the reaction values;
7	c. changing the reaction values in response to force for at least one
8	object to provide a set of adjusted reaction values;
9	e d. solving a solution to the physical dynamics solving for the physical
10	dynamics of the objects using the set of adjusted reaction values; and
11	fe. repeating steps c and e until the solution of step d is within a
12	predetermined acceptable tolerance.
13	(Original) 11. The method of claim 10 further including the step of
14	creating a nested grouping of a plurality of binary objects from the objects in the set.
15	(Currently Amended) 12. The method of claim 11 where the step of solving a
16	solution for the physical dynamics of the objects includes the step of starting with the
17	most deeply nested binary object and proceeding outward, solving a solution for the
18	physical dynamics solving for the physical dynamics of the objects in the binary objects at
19	the respective links.
20	(Original) 13. The method of claim 12 further including the step of
21	providing, for each link, one or more link weight values operable to constrain the
22	solution.
23	(Original) 14. The method of claim 13 where the step of changing
24	the reaction values for at least one object further includes the step of adjusting at least one

1	link weight value.										
2	(Original)	15.	The mo	ethod	of o	claim	14	where	the	link	weight
3	values are adjusted to main	tain a s	et of con	strain	ts on	the l	inks	within	a pi	redete	rmined
4	acceptable tolerance.										

(Currently Amended) 16. A method of simulating physical dynamics of a predetermined set of objects that are part of a computer/video game, the objects connected to each other at one or more respective links, with at least one link representing a hard contact between separate objects, wherein the method utilizes a game system comprising a collision subsystem, a dynamics subsystem, a game logic subsystem, a graphics subsystem and one or more central processing units supporting the game system; the method further comprising:

- a. grouping the objects in the predetermined set of objects into two binary objects to define a first binary object and a second binary object;
- b. grouping the objects in the first binary object into a subgroup of binary objects to define a nested group of binary objects in the first binary object;
- c. grouping the objects in the second binary object into a subgroup of binary objects to define a nested group of binary objects in the second-binary object; and
- d. starting with the most deeply nested binary object and proceeding outward, solving a solution for the physical dynamics of the objects in the binary objects at the respective links.
- (Original) 17. The method of claim 16 including the step of providing, for each link, one or more link weight values operable to constrain the solution.
 - (Currently Amended) 18. The method of claim 17 further including the step of

1	performing multiple iterative	e soluti	ons performing an iterative solution method multiple
2	times where at least one link	weight	value is adjusted at each iteration.
3	(Original)	19.	The method of claim 18 where the link weight
4	values are adjusted to main	tain a s	set of constraints on the links within a predetermined
5	acceptable tolerance.		
6	(Original)	20.	The method of claim 19 where the set of constraints
7	includes the following cons	straints:	the objects cannot interpenetrate each other and no
8	adhesive normal forces are a	pplied a	at the links.
9 .	(Original)	21.	The method of claim 20 where the predetermined
10	acceptable tolerance include	s a pred	letermined amount of interpenetration at a link.
11	(Original)	22.	The method of claim 21 where the predetermined
12	acceptable tolerance include	s a pred	letermined amount of adhesive normal force at a link.
13	(Currently Amended	23.	The method of claim 22 where the set of constraints
14 .	further includes the constrain	nt that,	at a respective link, either the relative lateral motion is
15	zero or the friction force at	the link	x is equal to the normal force times the coefficient of
16	friction a coefficient of fricti	on.	
17	(Original)	24.	The method of claim 23 where the predetermined
18	acceptable tolerance include	es a pre	determined difference between the friction force at a
19	link and the normal force tin	nes the	coefficient of friction.
20	(Currently Amended)	25.	A method of simulating the physical dynamics of a
21	predetermined set of object	cts that	t are part of a computer/video game, the objects
22	connected to each other at o	ne or m	ore links, at least one object represented by a plurality
23	of polygons, wherein the	metho	d utilizes a game system comprising a collision
24	subsystem, a dynamics subsy	ystem, a	a game logic subsystem, a graphics subsystem and one

1	or more central processing	g jinite	supporting the game system; the method further
		5 airits	oupporting the game system, the method further
2	comprising:		
3	a. creating a	nested	grouping of a plurality of binary objects from the
4	objects in the set, at least one	e binary	object containing two or more links; and
5	b. starting w	vith the	most deeply nested binary object and proceeding
6	outward, solving a solution	for the	physical dynamics solving for the physical dynamics
7	of the objects in the binary o	bjects a	t the respective links said one or more links.
8	(Original)	26.	The method of claim 25 where the solution
9	maintains a set of constraints	s on the	links within a predetermined acceptable tolerance.
10	(Original)	27.	The method of claim 26 where the set of constraints
11	includes the following cons	traints:	the objects cannot interpenetrate each other and no
12	adhesive normal forces are a	pplied a	at the links.
13	(Original)	28.	The method of claim 27 where the predetermined
14	acceptable tolerance includes	s a pred	etermined amount of interpenetration at a link.
15	(Original)	29.	The method of claim 28 where the predetermined
16	acceptable tolerance includes	s a pred	etermined amount of adhesive normal force at a link.
17	(Currently Amended)	30.	The method of claim 29 where the set of constraints
18	further includes the constrain	nt that, a	at a respective link, either the relative lateral motion is
19 ·	zero or the friction force at	the link	is equal to the normal force times the coefficient of
20	friction a coefficient of friction	on.	
21	(Original)	31.	The method of claim 30 where the predetermined
22	acceptable tolerance include	s a pred	determined difference between the friction force at a
23	link and the normal force time	es the c	coefficient of friction.
24	(Original)	32.	The method of claim 31 including the step of

1	providing, for each link, one or more link weight values operable to constrain the
2	solution.
3	(Currently Amended) 33. The method of claim 32 further including the step of
4	performing multiple iterative solutions performing an iterative solution method multiple
5	times where at least one link weight value is adjusted at each iteration.
6	(Currently Amended) 34. A method of simulating the physical dynamics of a
7	predetermined set of objects that are part of a video game, the objects connected to each
8	other at at least one respective link, wherein the method utilizes a game system
9	comprising a collision subsystem, a dynamics subsystem, a game logic subsystem, a
10	graphics subsystem and one or more central processing units supporting the game system;
11	the method further comprising:
12	a. providing <u>a</u> set of equations that when solved define a solution to
13	the physical dynamics of the set of the predetermined set of objects the predetermined set
14	of objects, the solution having the following constraints: the objects cannot interpenetrate
15	each other and no adhesive normal forces can be applied at the links;
16	b. assigning at least one link weight to each of the links in the
17	predetermined set of objects;
18	c. solving an iterative solution for the physical dynamics of the
19	objects using the assigned weights solving for the physical dynamics of the objects using
20	the assigned weights using an iterative solution method;
21	d. adjusting the assigned link weights if the constraints are violated at
22	a link;
23	e. solving an iterative solution for the physical dynamics of the

e. solving an iterative solution for the physical dynamics of the objects using the adjusted weights; and

24

1	f. repeating steps d. and e. until a solution is within a predetermined
2	acceptable tolerance.
3	(Currently Amended) 35. The method of claim 34 wherein the a
4	predetermined acceptable tolerance includes a predetermined amount of adhesive normal
5	force at a link.
6	(Original) 36. The method of claim 35 wherein the predetermined
7	acceptable tolerance includes a predetermined amount of interpenetration between two
8	objects at a link.
, 9	(Original) 37. The method of claim 36 wherein the weights are
10	decreased for links where adhesive normal force is applied.
11	(Original) 38. The method of claim 37 wherein the weights are
12	increased for links where interpenetration occurs.
13	(Currently Amended) 39. A method of simulating the physical dynamics of a
14	predetermined set of objects that are part of a video game, the objects connected to each
15	other at one or more respective links, wherein the method utilizes a game system
16	comprising a collision subsystem, a dynamic subsystem, a game logic subsystem, a
17	graphics subsystem and one or more central processing units supporting the game system;
18	the method further comprising:
19	a. providing a set of equations that when solved define a solution to
20	the physical dynamics of the set of the predetermined set of objects the predetermined set
21	of objects, the solution having the following constraints: the objects cannot interpenetrate
22	each other and no adhesive normal forces can be applied at the links, and that, at a
23	respective link, either the relative lateral velocity is zero, or the friction force is equal to
24	the normal force at the link times the a coefficient of friction;

1	b. assigning at least one link weight to each of the links in the
2	predetermined set of objects;
3	c. solving an iterative solution for the physical dynamics of the
4	objects using the assigned weights solving for the physical dynamics of the objects using
5	the assigned weights using an iterative solution method;
6	d. adjusting the link weights assigned to the links if the constraints
7	are violated at a link;
8	e. solving an iterative solution for the physical dynamics of the
9	objects using the adjusted weights; and
10	f. repeating steps d. and e. until a solution is within a predetermined
11	acceptable tolerance.
12	(Original) 40. The method of claim 39 wherein the a
13	predetermined acceptable tolerance includes a predetermined amount of adhesive normal
14	force at a link.
15	(Original) 41. The method of claim 40 wherein the predetermined
16	acceptable tolerance includes a predetermined amount of interpenetration between two
17	objects at a link.
18	(Currently Amended) 42. The method of claim 41 where the predetermined
19	acceptable tolerance includes a predetermined difference between the friction force at a
20	link and the normal force times the a coefficient of friction.
21	(Original) 43. The method of claim 42 wherein the weights are
22	decreased for links where adhesive normal force is applied.
23	(Original) 44. The method of claim 43 wherein the weights are
24	increased for links where interpenetration occurs.

1	(Currently Amended) 45. A system for simulating the physical dynamics of a
2	set of objects within a video game, the objects connected to each other at one or more
3	respective links, the system comprising:
4	a. a binary division unit having logic operable to createing a nested
5	grouping of a plurality of binary objects from the objects in the set; and
6	b. a dynamics unit having logic operable to solve a set of physical
7	dynamics equations; and
8	c. one or more central processing units supporting the system.
9	(Original) 46. The system of claim 45 where the dynamics unit
10	comprises a set of multiple processors, each processor operable to solve a set of physical
11	dynamics equations.
12	(Original) 47. The system of claim 46 where said multiple
13	processors are used to solve the dynamics equations of multiple binary objects in parallel.
14	(Currently Amended) 48. The system of claim 47 where each link includes
15	one or more link weight values operable to constrain the <u>a</u> solution.
16	(Currently Amended) 49. The system of claim 48 where the dynamics unit
17	further comprises logic operable to perform multiple iterative solutions perform an
18	iterative solution method multiple times wherein one or more link weight values are
19	adjusted at each iteration.
20	(Original) 50. The system of claim 49 where the link weight
21	values are adjusted to maintain a set of constraints for each link within a predetermined
22	tolerance.
23	(Original) 51. The system of claim 50 where said set of constraints
24	includes the following constraints: the objects cannot interpenetrate each other and no

- 1 adhesive normal force is applied.
- 2 (Original) 52. The system of claim 51 where the set of constraints
- further includes the constraint that, at a respective link, either the relative lateral motion
- between the objects is zero or the friction force at the link is equal to the normal force
- 5 multiplied by the a coefficient of friction.